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EXAMINER

PAUGETT, M

ART UNIT PAPER NUMBER

1112

DATE MAILED:

01/23/96

AIM1/0123
SIXBEY FRIEDMAN LEEDOM & FERGUSON P.A.
2010 CORPORATE BLVD
SUITE 600
MCLEAN VA 22102

This is a communication from the examiner in charge of your application.
COMMISSIONER OF PATENTS AND TRADEMARKS

☒ This application has been examined ☒ Responsive to communication filed on 10/4/95 ☐ This action is made final.

A shortened statutory period for response to this action is set to expire 3 month(s), 0 days from the date of this letter.
Failure to respond within the period for response will cause the application to become abandoned. 35 U.S.C. 133

Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

- ☒ Notice of References Cited by Examiner, PTO-892.
- ☐ Notice of Draftsman's Patent Drawing Review, PTO-948.
- ☒ Notice of Art Cited by Applicant, PTO-1449.
- ☐ Notice of Informal Patent Application, PTO-152.
- ☐ Information on How to Effect Drawing Changes, PTO-1474.
- ☐

Part II SUMMARY OF ACTION

1. ☒ Claims 1-22 are pending in the application.

Of the above, claims _____ are withdrawn from consideration.

- ☐ Claims _____ have been cancelled.
- ☐ Claims _____ are allowed.
- ☒ Claims 1-22 are rejected.
- ☐ Claims _____ are objected to.
- ☐ Claims _____ are subject to restriction or election requirement.
- ☐ This application has been filed with Informal drawings under 37 C.F.R. 1.85 which are acceptable for examination purposes.
- ☐ Formal drawings are required in response to this Office action.
- ☐ The corrected or substitute drawings have been received on _____. Under 37 C.F.R. 1.84 these drawings are ☐ acceptable; ☐ not acceptable (see explanation or Notice of Draftsman's Patent Drawing Review, PTO-948).
- ☐ The proposed additional or substitute sheet(s) of drawings, filed on _____, has (have) been ☐ approved by the examiner; ☐ disapproved by the examiner (see explanation).
- ☐ The proposed drawing correction, filed _____, has been ☐ approved; ☐ disapproved (see explanation).
- ☒ Acknowledgement is made of the claim for priority under 35 U.S.C. 119. The certified copy has ☒ been received ☐ not been received ☐ been filed in parent application, serial no. _____; filed on _____.
- ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 O.G. 213.
- ☐ Other

EXAMINER'S ACTION

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(15). Applicant's information disclosure is made of record and a copy of the PTO-1449 enclosed. It is noted that applicant listed 96 applications as related (S.N. and title only), however given the time constraints for examining, it is impossible to find and review such a number of cases of unknown relationship.

(16). The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The present title describes all of class 437 and applicants claims don't even contain any device elements, only intended generic use!

(17). The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

(18). Claims 1-22 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Use of relative terms is considered vague and indefinite as they do not provide clear metes and bounds. Examples of such terms include "strong" and "improving". Note "thin film" is considered an art recognized term.

Note that the phrase "for accelerating" does not provide any

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positive limitation to the process claims and does not specify by what effect or how (ie during what technique) the element might act to do so. Also "accelerating" compared to what? One temperature may produce faster results than another, a diffuse *lamp light may* be slower than a ^{concentrated} laser, etc.

In claim 5, what if anything does "in a state" add to the claim? Likewise in subsequent usages.

In claim 11, how can one have "a compound thereof" of a film? In the last line "a crystallin^e-imparted silicon film" has the wrong article if it refers to what was produced in lines 6-7. Likewise for analogous wording in claim 17.

In claim 18 "ammonia water" is not standard nomenclature, and claim 16 is not understood. How can an element being applied via solution to the α -Si be "an interstitial element"? This is a description of location which contradicts that already claimed unless the claims ^{limitations} ~~statements~~ are incomplete. This shows uncertainty in what the step of "apply ... solution" or "solvent" actually means in claims 14-20.

19. The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. § 103 which forms the basis for all obviousness rejections set forth in this Office

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action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Subject matter developed by another person, which qualifies as prior art only under subsection (f) or (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

20 Claims 1-2, 5 and 21 are rejected under 35 U.S.C. § 102(b) as being anticipated by the U.S. patents to Liu et al.

Claims 1, 2, 5-7, 10-12 and 21-22 are rejected under 35 U.S.C. § 103 ^{unpatentable over} as being anticipated by Fonash et al in view of Liu et al.

In Liu et al, see Abstract; col. 2, line 60-68; Summary; Col. 4, lines 21-64; Col. 5, lines 19-26, 52-53 and Example 2.

In Fonash et al, see Abstract; Fig. 1; Col. 1, lines 32-62; Summary; Col. 2, lines 34- Col. 3, lines 31 and 42-52 (note that the samples that contained annealed structures were held at 400°C during a succeeding deposition; ie a heat treatment).

It is noted these claims do not specify when or how the metal is introduced in or in contact to the α -Si film, so either a layer above or below is sufficient as the deposition technique

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for the metal or especially the PECVD in Fonash et al will produce some interface mixings so that some Pd or Ni is in the α -Si film at some depth.

Of particular interest is that the annealing system used by Liu et al, "AG Associates heat pulse TM 210 rapid thermal annealing system" is the same as referred to in the prior art (bottom col. 2) as using tungsten-halogen bulbs (ie, strong pulsed light), with equivalence shown to furnace annealing system (which is what Fonash et al appear to be using, hence it would have been obvious to one of ordinary skill to use the Heat pulse, ie, pulsed light ^{radiation} ~~racket~~ for RTP in Fonash et al's variation on the nucleation site annealing process.

Concerning claim 21, exactly what is intended by the alternating irradiation/heat treatment of steps 2 and 3 is unclear, however they would read on the mechanism by which pulsed light radiation as applied above (Liu et al) treats the α -Si and metal, since between each light pulse the coated substrate is in a heated state.

Note that the combined disclosures of Liu et al and Fonash et al shows that the location of the metal nucleation sites, generally above or generally below the α -Si is not important to their catalytic effect to crystallization, but their presence in contact with the amorphous silicon is the key factor (theorized to be a result of thermal conductivity).

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(21)

Claims 3-4, 8-9 and 13 are rejected under 35 U.S.C. § 103 as being unpatentable over Liu et al and Fonash et al as applied to claims 1-2, 5-7, 10-12 and 21-22 above, and further in view of Hemple et al or Hayzelden et al.

^{Liu and Fonash et al}
While [^]do not teach use of metal elements in an interstitial position in α -Si films, either Hayzelder et al (abstract; paragraphs 2-4) or Hempel et al (Abstract, page 921) teach α -Si with either ion implanted or co-sputtered Ni, respectively, both of which show the same phenomenon as taught in either Liu et al or Fonash et al of a lower temperature/quicker annealing with the presence of a metal (NI) as a catalyst, hence it would have been obvious to one of ordinary skill that implanted or co-sputtered ^{tro}induction [^]of metal catalyst into α -Si films would produce the same effects in the above Liu and Fonash combination as their use of either an upper or lower very thin layer, especially as the furnace annealing techniques have already been shown to be essentially equivalent to Heatpulse TM annealing. Note Hempel's concentration is given in different units (at%) which examiner can not convert with the information available and Hayzelden et al only give the peak concentration, hence the average for the layer would be considerably lower, probably in applicants' range, however it would have been obvious to one of ordinary skill to optimize concentration for most advantage annealing. Note all references teach the claimed temperatures.

(22) Fan et al is considered to be essentially equivalent to Liu et al and Fonash et al except it deposits α -Si on a conductive layer such as Cu, Ag, Au, etc, then laser irradiates to get a crystallization front (col 2, line 50- col 3, line 30 and col 11, line 50 - col 12, line 25).

(23) Claims 1-3, 6-8, 11-13 are rejected under 35 U.S.C. § 102(b) as being clearly anticipated by Celler.

See abstract; Col 1, lines 23-40 and 55- Col. 2, line 30; Col. 3, lines 26-34 and lines 46- col. 4, line 68, esp. lines 4-14, 46 and 56-59; col. 5, lines 18-32 and col. 6, lines 10-19.

(24) Claims 14-20 are rejected under 35 U.S.C. § 103 as being unpatentable over Liu et al and Fonash et al, or Celler as applied to claims (1-2, 5-7, 10-12, 21-22) or (1-3, 6-8, 11-13), respectively above, and further in view of Pressley.

Neither of the above sets of rejections teach application of the metal materials via a solution, however applying "dopant" materials via solution is a conventional practice, and as shown in col. 3, lines 3-11 of Pressley may be considered equivalent to vapor deposition or ion implantation when further irradiation treatment is contemplated, hence it would have been obvious to apply metals as taught by Liu et al and Fonash et al for annealing purposes via solutions as it puts the element in the same site as in Liu et al with the expectation of equivalent results.


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Pressley is equally applicable to Cellar, as both references intent is to getter defects by metallic elemental impurities, hence it would have been obvious to use Pressley's mode of control via purposeful introducts of impurities in Cellar mode of treating defects, including introduction via solution.

It is noted that solutions as discussed in Pressley are commonly aqueous, hence use of water or polar solvent in such depositions would have conventional.

(25) Imahashi et al and Moddel et al are Interest for ^{repetitive}~~repeture~~ irradiation/heating technique, Togeï shows the criticality of a metal layers thickness, ie masking effects.

(26) Any inquiry concerning this communication should be directed to M. L. Padgett at telephone number (703) 308-2336.


MARIANNE PADGETT
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January 22, 1996